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LAMPS FOR USE WITH THE BINOCULAR MICROSCOPE

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Four lamps made from fountain-pen-type flashlights are illustrated in figure 1. These lamps have some advantages for illuminating insects for microscopic examination by reflected light. Since each bulb is partly enclosed in a metal cap and is made with a lens blown into the glass, most of the light is concentrated in a narrow cone. The heat produced by the small bulbs is negligible.

Delicate control of the distribution of light, even on dark-colored insects 2 or 3 mm. long, is a point in favor of the lamps. By adjusting them at any desired angle or distance, glints and deep shadows can be avoided. This more even lighting, less intense than that ordinarily used, may be found to provide more comfortable vision.

Experimental use of the lamps for photomicrography of small dead insects has indicated that, although the intensity of the light is rather low, the control of illumination attained is advantageous.

Each bulb produces about 6 foot-candles at a distance of 6 inches. Four of them focused on one point 2 or 3 inches from the bulbs combine to give a maximum intensity of about 60 foot-candles. The intensity can be increased by raising the voltage, but the life of the bulbs may thus be shortened. The bulbs cost very little and are easily renewed.

The strength of the bulbs used is 2.3 volts. Because the small batteries ordinarily used in the pen flashlights are short-lived, it is advisable to have a more permanent source of current. The lamps shown in figure 1 were connected in parallel to two 1½-volt dry cells. Enough resistance was added to the circuit to reduce the voltage to 2.3 at the bulbs. The same lamps have been operated on a storage battery and, with a transformer, on house current.

At least three types of pen flashlights are on the market. The type shown in figure 1 opens at the end opposite the bulb. Through this opening one of the wires was inserted and soldered to the center terminal of the bulb socket. The other wire was soldered to the outside of the flashlight case. The inside wire connection can be made so that the flashlight switch may be used to turn the lamps on and off.

The supports to which the pen lights were attached by tape were made in a plumbing shop. Eighteen-inch lengths of flexible metal tubing covered with woven metal fabric, of 7/16-inch outside diameter, were used for the goosenecks. One end of the tubing was embedded in lead poured into a plumber's escutcheon, or flange, 3 inches in diameter and 1-3/4 inches high, of nonrusting finish. Uneven spots on the surface of the lead bases were ground off to prevent tilting. Gooseneck desk lamps with the sockets removed would serve the same purpose and would cost less; the disadvantage of such stands would be the larger area of desk space occupied by the bases.

The cost of materials for making the lamps was about $15.00. At present prices, but using flexible metal tubing of a less expensive grade, they can be made for about $18.00, as follows:

Fountain-pen flashlights, 4 at 80 cents	$3.20
Flexible fixture wire, 30 feet at 5 cents	1.50
Labor for wiring, 1 1/2 hours at $2.50	3.75
Dry cells, 1 1/2 volts, 2 at 54 cents	1.08
Flexible metal tubing, 6 feet at 10 cents	.60
Making bases, materials $4.00, labor $4.00	8.00
Total	$18.13

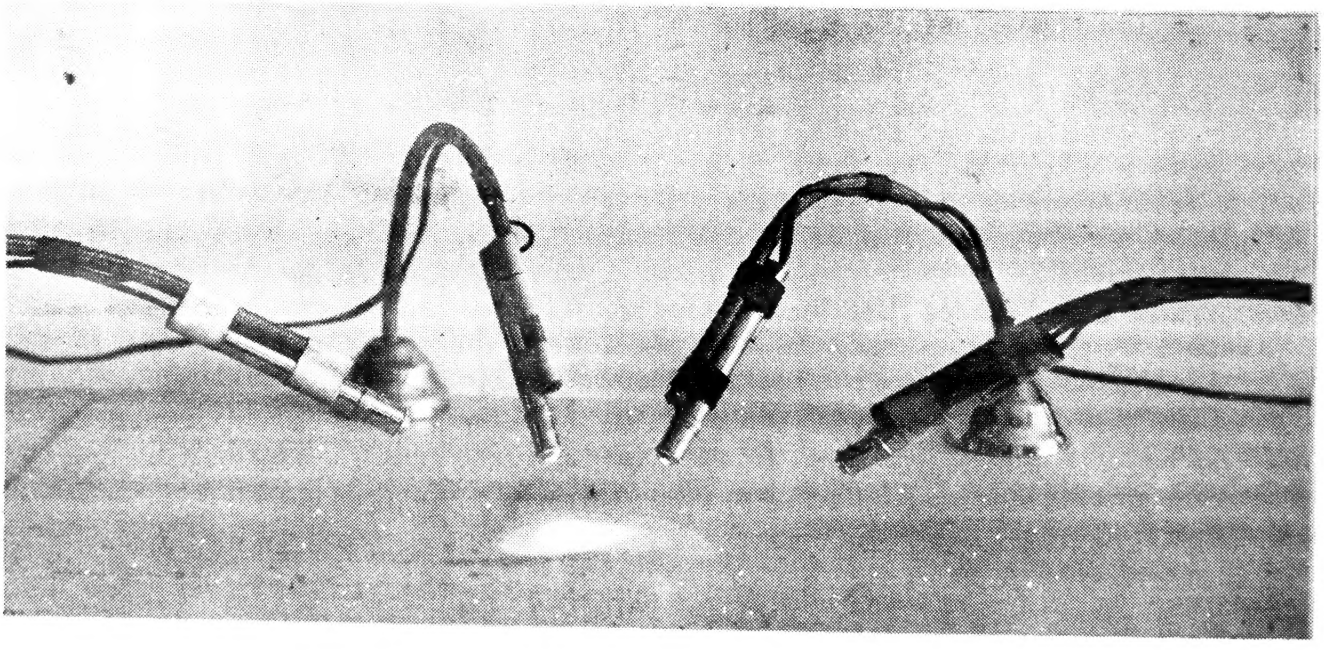

Figure 1.--Fountain-pen-type flashlights adapted for use with the binocular microscope.